

# **CRUSADER**

## **The Army XXI Firepower Revolution**

**Presented to:**

### **Future Combat System M&S Working Session**

**Presented by:**

**Wes Beal  
OPM Crusader,  
Systems Engineering**

#### **For Additional Information**

**phone: (973) 724-7655**

**fax: (973) 724-2221**

**e-mail: [wbeal@pica.army.mil](mailto:wbeal@pica.army.mil)**

**web pages: <http://www.pica.army.mil/orgs/crusader>**

**<http://www.teamcrusader.com>**

**7 March 2000**



# Crusader - A System for the 21st Century



## Lethal Firepower

- Cooled Cannon for Continuous Fires
- 10-12 Rnds/minute out to 40-50 km
- Enhanced Accuracy with Projectiles

XM2001  
System

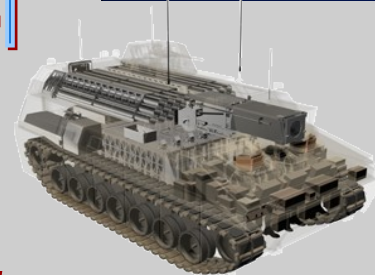


## Crew Cockpit Enables Information Dominated Warfare

- Mission Planning
- Situational Awareness
- Decision Aids

RSV-T

XM2002



## Fully Automated

- Resupply
- Ammunition Handling
- Aiming
- Loading & Firing

RSV-W

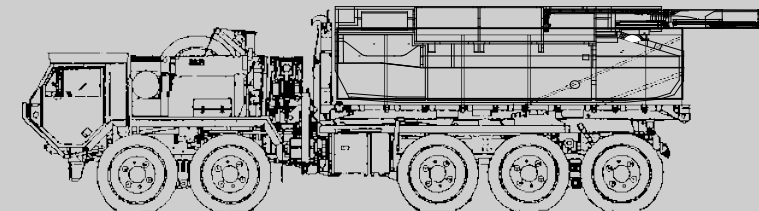
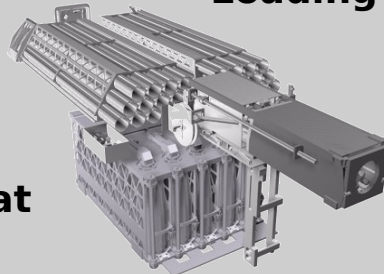
XMXXXX

## Highly Mobile

- 1500 HP to Meet & Exceed M1/M2
- First Drive-by-Wire Ground Combat Vehicle
- Ride Quality Better than M1/M2

## Unmatched Survivability

- Separate Crew & Weapon Stations
- Composite Armor
- Ballistic & Non-ballistic



## Track / Wheeled RSV

- Greater O & O Flexibility
- Match Systems to Intensity

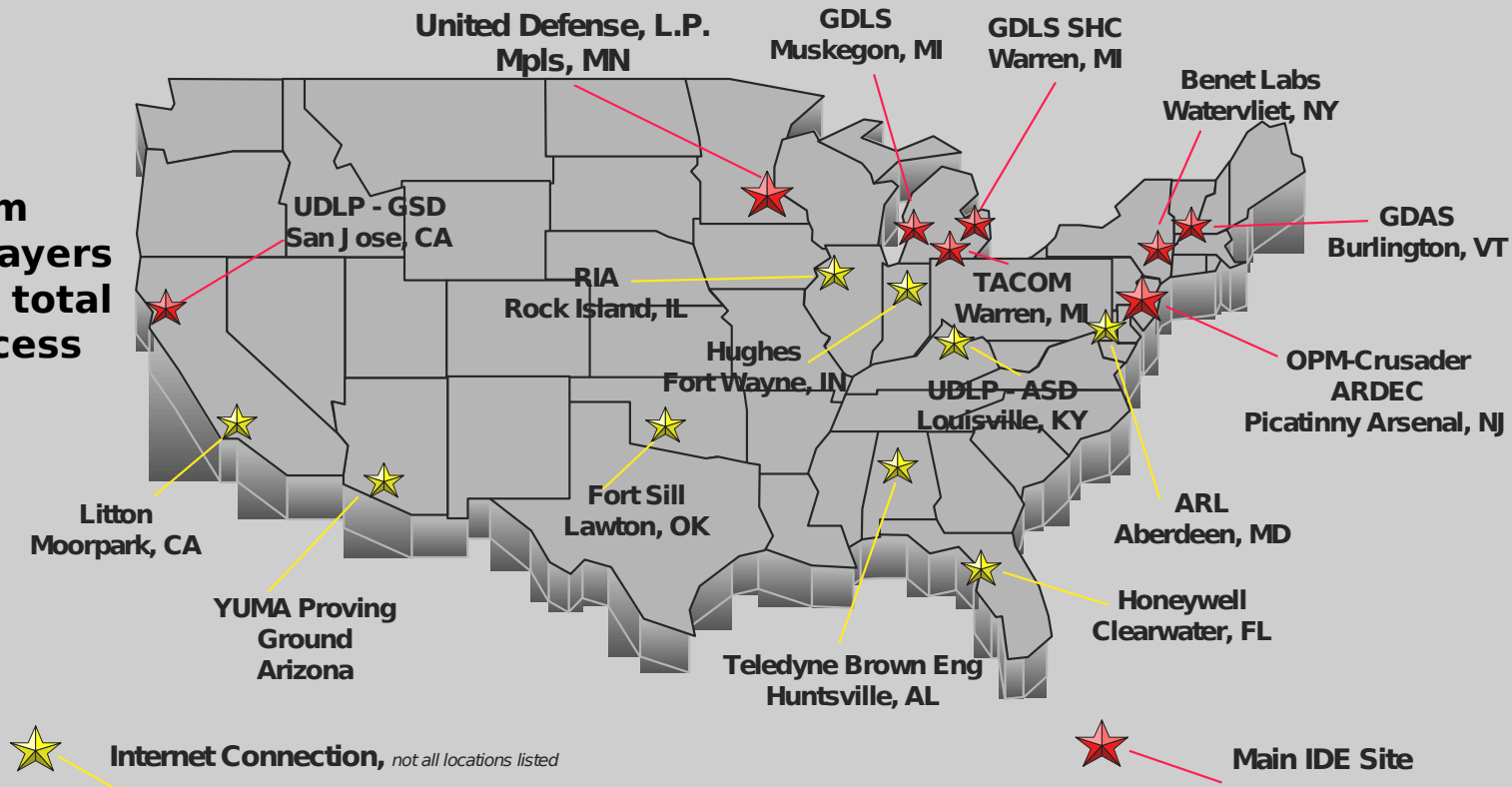




# Integrated Data Environment Lessons Learned

## Objective

- ❖ Link all Team Crusader players to facilitate total system process

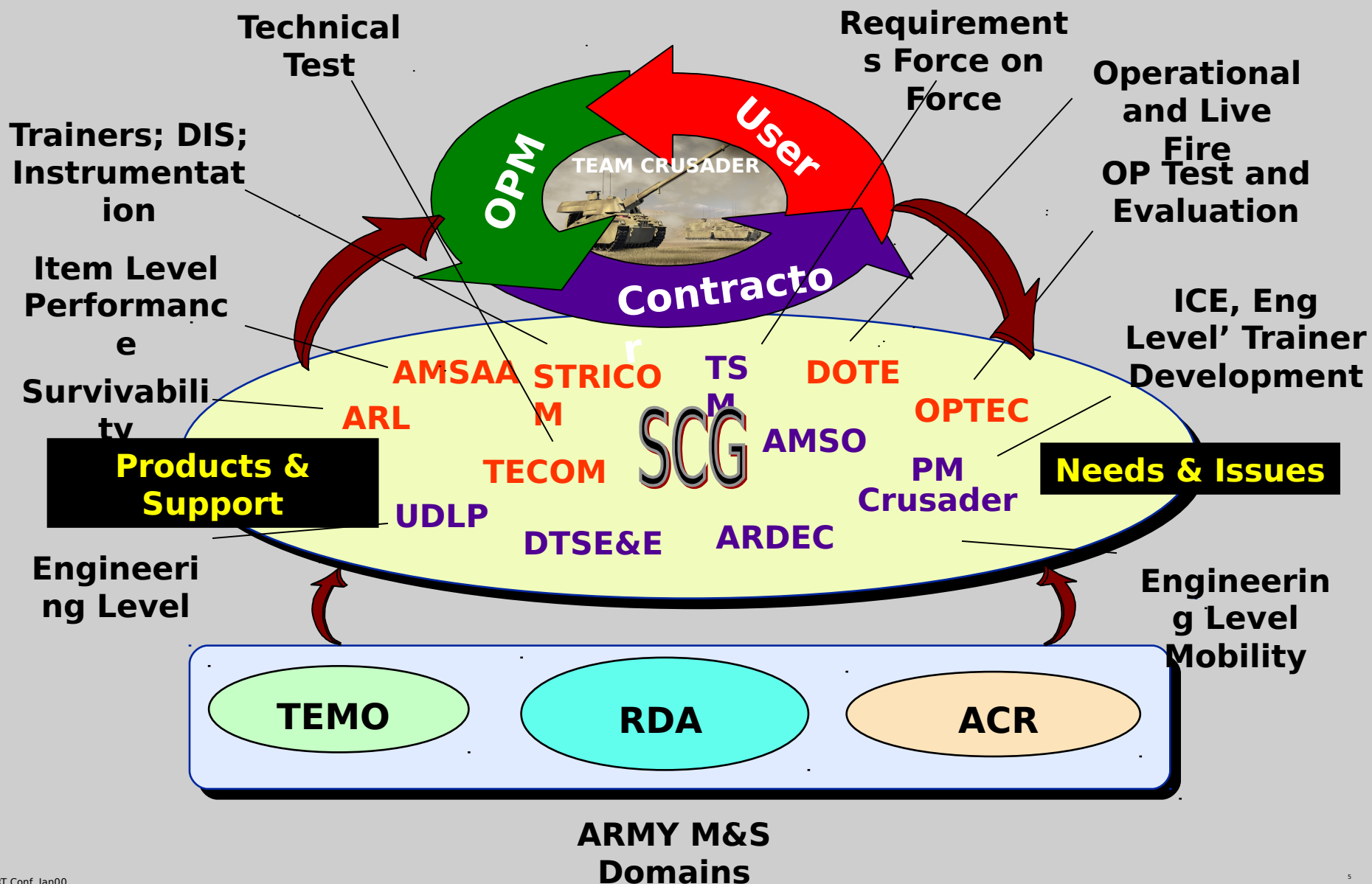


## Lessons Learned

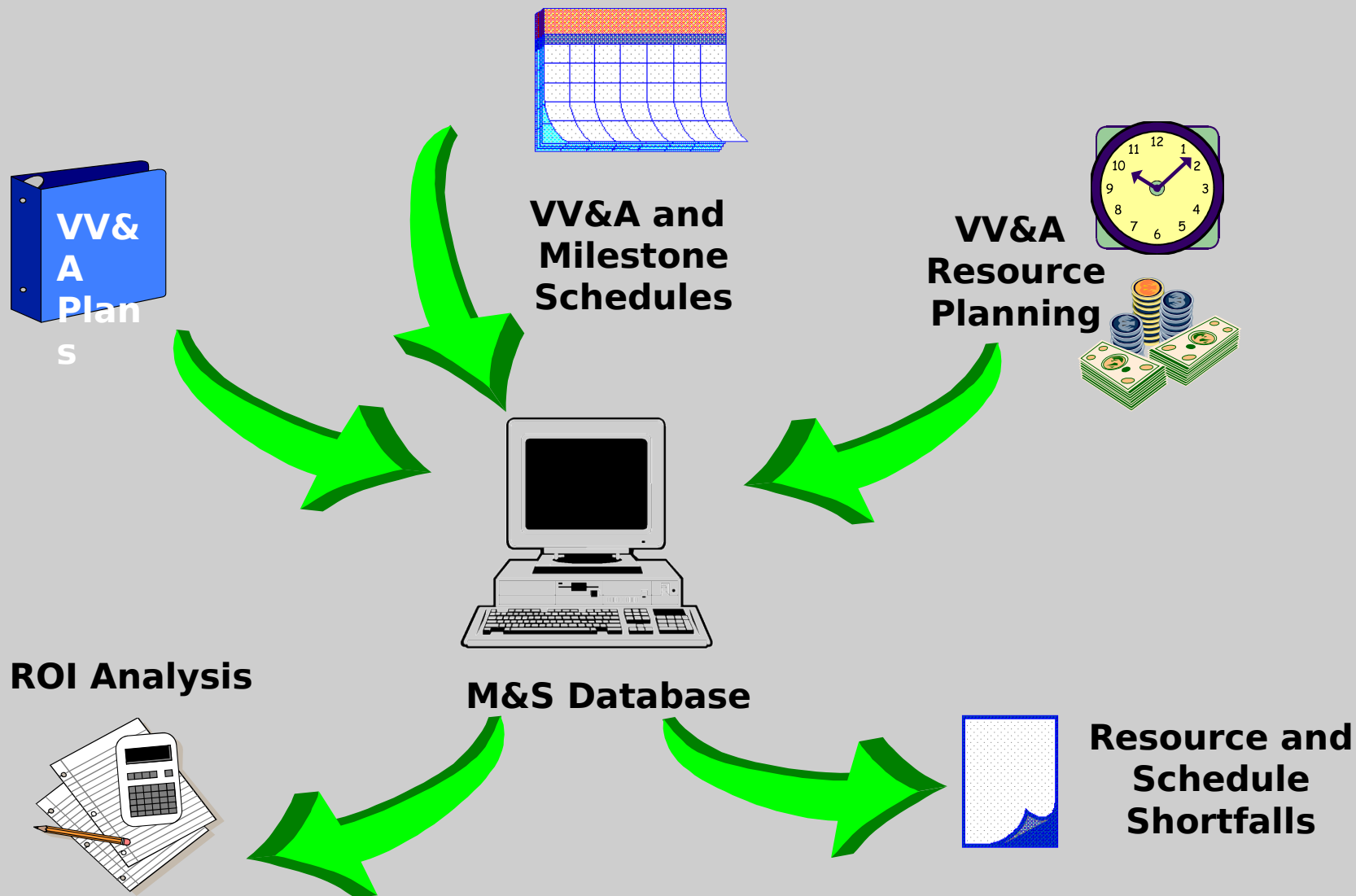
- ❖ Integrated Environment must have capacity to share entire master model
- ❖ Advanced tools require greater learning time and must be tailored to Program needs
- ❖ Engineering models provide data to CAIV process



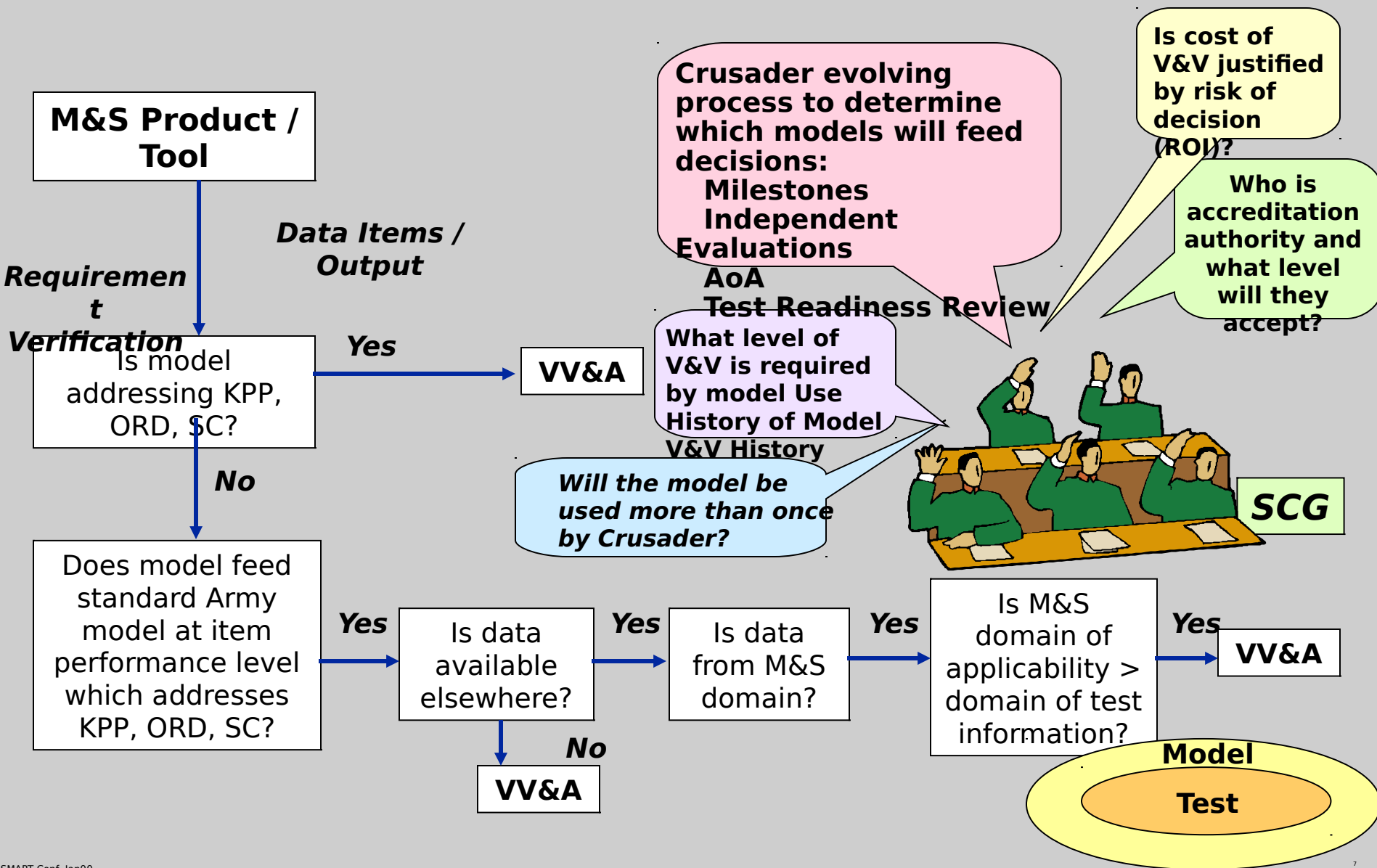
# Simulation Coordinating Group (SCG)



# M&S Database



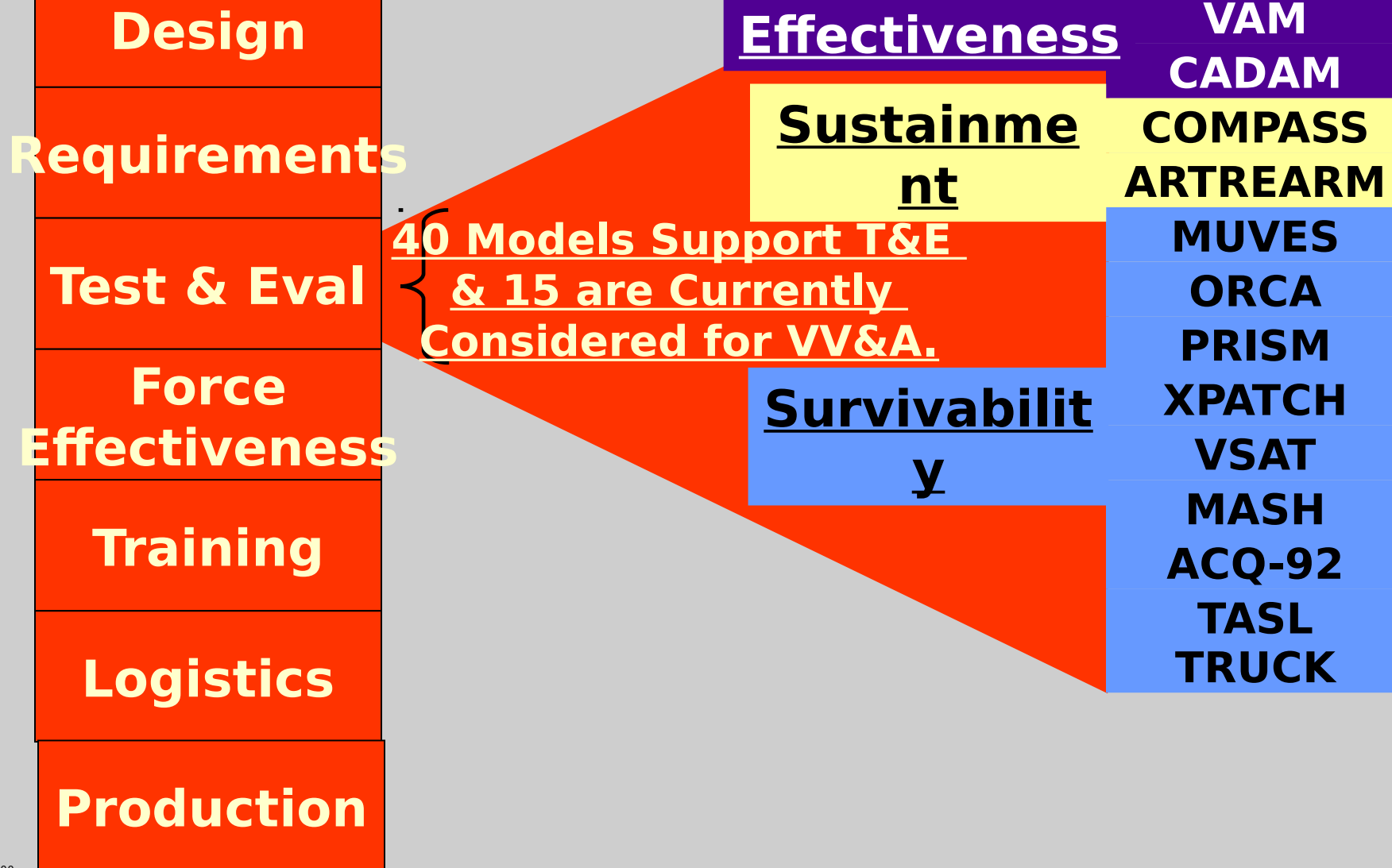
# VV&A Decision Process





# T&E VV&A Candidates

**150 Models Support Crusader :**





# Force Effectiveness



## ❖ **Crusader Concept Experimentation Programs (CEP) I-III:**

- ♦ **Used M&S (FireSim XXI and JANUS)**
- ♦ **Confirm TTPs and Operational Concepts for Crusader**

## ❖ **A Number of Important Lessons Arose out of CEP I-III**

- ♦ **Crusader Rearm more effective with pooled RSVs**
- ♦ **Survivability movements**
- ♦ **AFATDS system improvements identified:**
  - **Platoon leaders wanted an additional screen to track ammo assets**
- ♦ **MLRS Battalion played in CEP III**
  - **Optimization of Crusader and MLRS mission**
- ♦ **SADARM was the preferred munition as being most lethal**
- ♦ **Crusader-Comanche Sensor-to-Shooter**
  - **Expanded Battlespace**
  - **Enhanced Mobility Simultaneity and Precision Attacks**



# Modeling and Simulation Crusader Production Planning

Low Fidelity

High Fidelity



## Enterprise Model

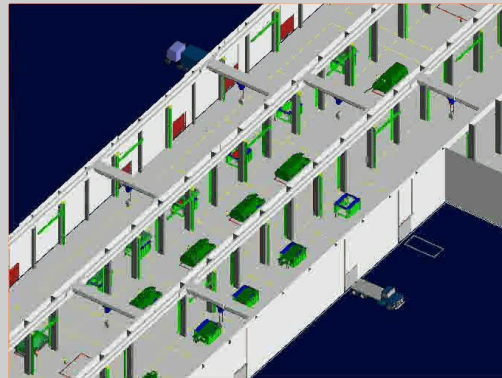


### Model Outputs

- Cost model input
- Inventory costs
- Logistics plan

**Lesson Learned: Production modeling has demonstrated a potential cost saving in using a removable glacis plate for crew compartment equipment installation**

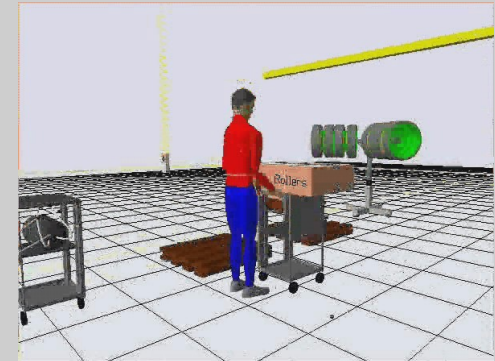
## Factory Model



### Model Outputs

- Factory layout
- Material flow
- Resource utilization
- Manpower requirements
- Thruput time
- Bottlenecks
- Line flexibility

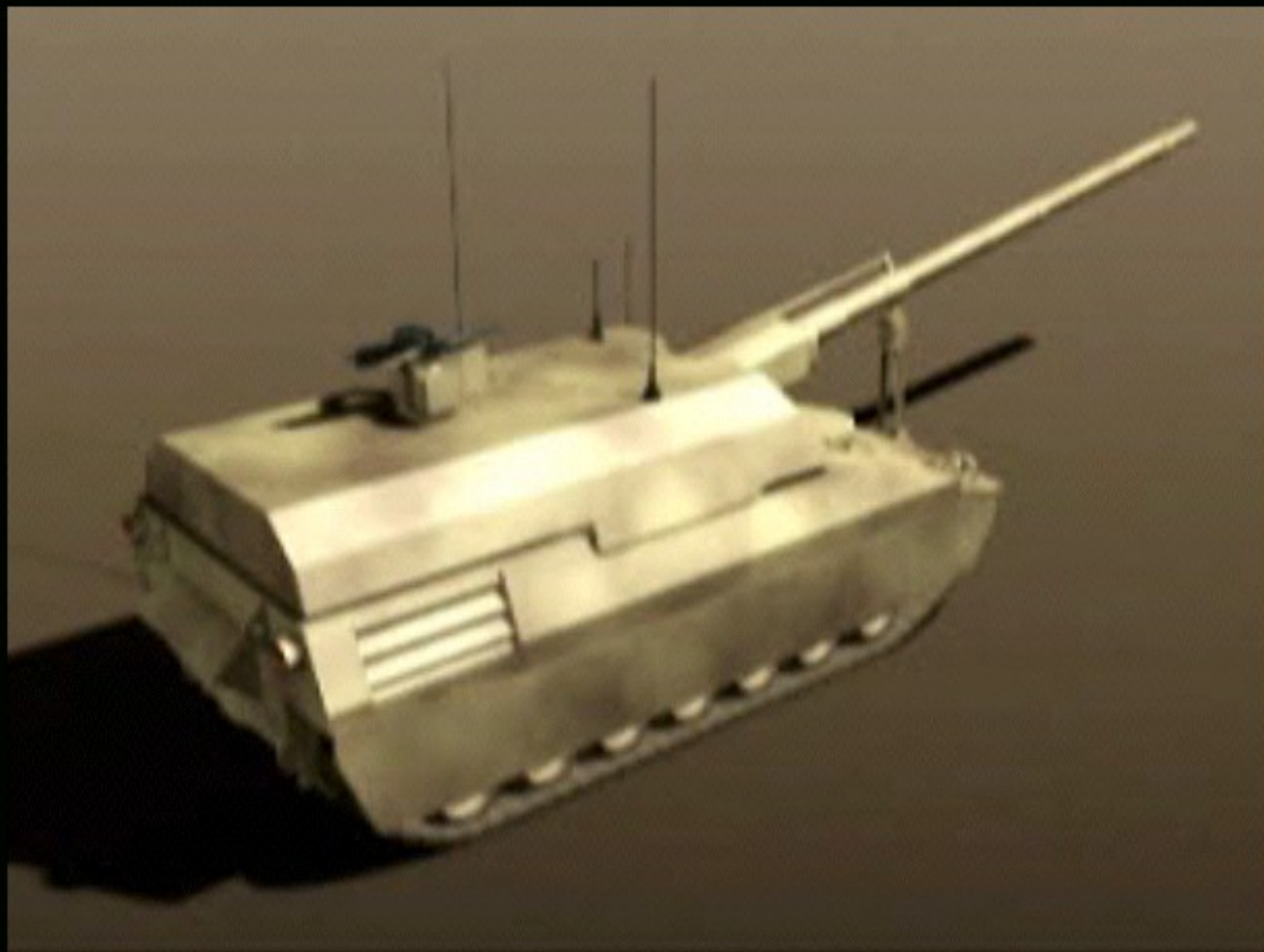
## Operational Model



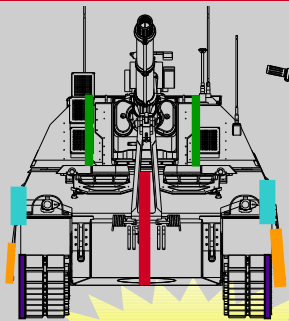
### Model Outputs

- Cell layout
- Process simulation
- Producibility
- Assembly work instructions
- Tooling/Fixture requirement
- Manpower requirements
- Ergonomics/Safety

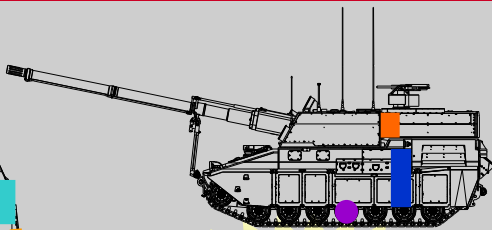
# Refined Crusader



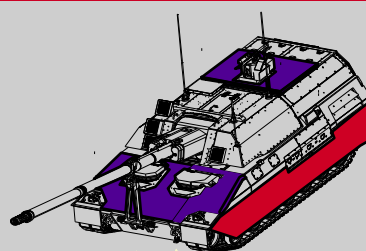
# Weight Savings Summary Chart



**Width**  
Saves 1-2 Tons

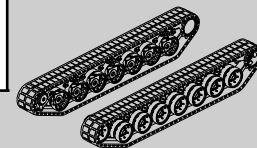


**Length**  
Saves 1-1.5 Tons



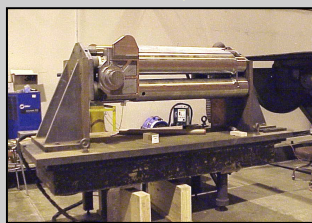
**Protection by Kits**  
Saves 3 Tons

**Power Package?**

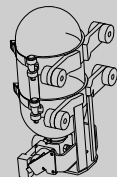


Suspension System

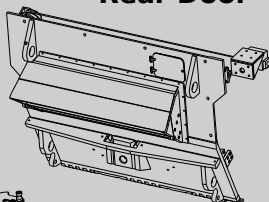
**Mobility**  
Saves 5-6 Tons



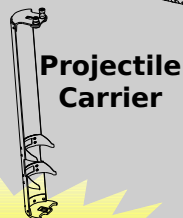
Gun Cradle



AFES Bottles



Rear Door



Projectile Carrier

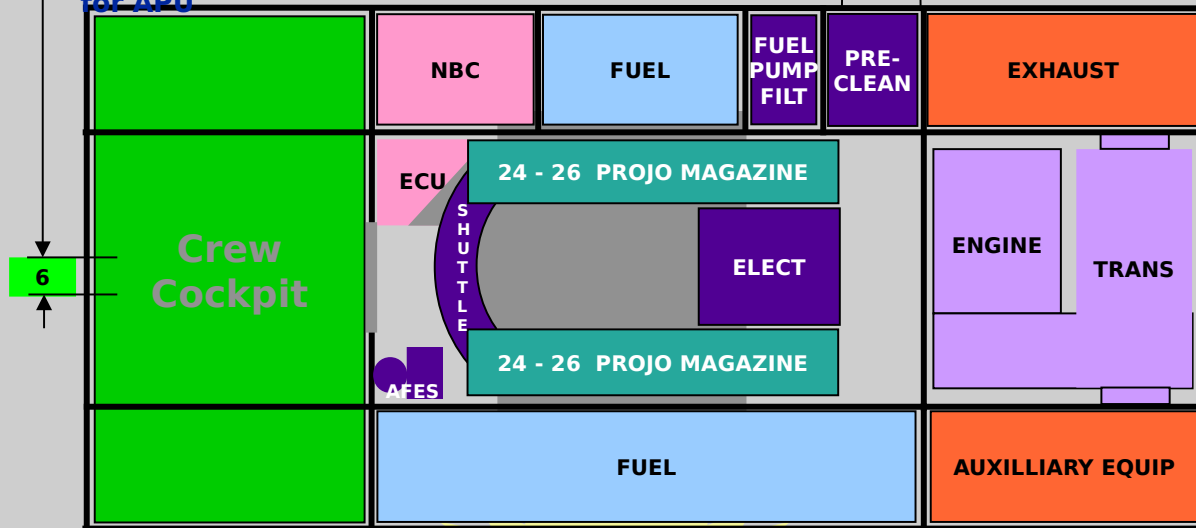
**Material Changes**  
Saves 4 Tons

Trade Fuel (Range) for APU

Reduce Propellant Charges  
From 260 to 176

16

Bulkhead Move



**Payload**  
Saves 1 Ton



# 2 vs. 3 Man Crew Study

## Timeline for the Model Runs:

- ❖ 29 Mar 00 - Reconcile 3-Crew IMPRINT Model with VIL
- ❖ 05 Apr 00 - Run 3 Crew-Model Excursions
- ❖ 14 Apr 00 - Convert 3-Crew IMPRINT Model to 2-Crew
- ❖ 21 Apr 00 - Run 2-Crew Model Excursions
- ❖ 12 May 00 - Refine Analysis & Summarize Results

## IMPRINT

**A network modeling tool designed to help assess the interaction of soldier and system performance. It incorporates task analysis, workload modeling, performance shaping and degradation functions and stressors, and embedded personnel characteristics data**